

DYLAN LAPLACE MERMOUD

Postdoctoral researcher in discrete mathematics
Unité de Mathématiques Appliquées, ENSTA Paris, Institut Polytechnique de Paris

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PERSONAL INFORMATION

Born in Saint-Michel (16), France, on October 25, 1996. French nationality. Phone: +33 (0)7 82 58 74 64.

AREAS OF INTEREST

Discrete mathematics, combinatorial optimization, quantum computing, cooperative game theory, combinatorial geometry, algebraic combinatorics.

EXPERIENCES

- | | |
|--------------|---|
| 2023 - | Postdoctoral researcher
<i>Unité de Mathématiques Appliquées, ENSTA Paris, Institut Polytechnique de Paris</i>

Quantum computing for combinatorial optimization. |
| 2022 - 2023 | Temporary teaching and research associate (french ATER contract)
<i>Centre d'Économie de la Sorbonne, Université Paris I Panthéon-Sorbonne</i>

Teaching (192h), doctoral research (see below). |
| 2019 - 2022 | Doctoral contract employee
<i>Centre d'Économie de la Sorbonne, Université Paris I Panthéon-Sorbonne</i>

Teaching (64h per year), doctoral research (see below). |
| 04-08 / 2019 | End-of-studies internship
<i>French ministry of defence</i>

Edge formation predictions in dynamic graphs. |

EDUCATION

Université Paris I Panthéon-Sorbonne

- Doctoral degree, Mathematics (2023).
 - Supervisors: MICHEL GRABISCH and PETER SUDHÖLTER.
 - Title: “Geometry of set functions in game theory: combinatorial and computational aspects”.

Sorbonne Université

- Master's degree, Mathematics (2019).
 - First major in *Mathematics of modelling*, jointly managed by Sorbonne Université, École Polytechnique and École Nationale des Ponts et Chaussées.

- Second major in *Big Data and AI*.
- Theses on the prediction of edge formation in dynamic graphs and the appearance of cooperative behaviour in repeated games.
- First year on a more abstract mathematics-oriented course: Galois theory, differential geometry, algebraic topology, number theory, Riemann surfaces, etc.
- Bachelor’s degree, Mathematics (2017).

PUBLICATION

1. LAPLACE MERMOUD, D., GRABISCH, M., SUDHÖLTER, P., “Minimal balanced collections and their application to core stability and other topics of game theory,” *Discrete Applied Mathematics*, vol. 341, pp. 60-81, 2023. <https://doi.org/10.1016/j.dam.2023.07.025>
 - Abstract: Minimal balanced collections are a generalization of partitions of a finite set of elements and have important applications in cooperative game theory and discrete mathematics. However, their number is not known beyond $n = 4$. In this paper we investigate the problem of generating minimal balanced collections and implement the Peleg algorithm, permitting to generate all minimal balanced collections till $n = 7$. Secondly, we provide practical algorithms to check many properties of coalitions and games, based on minimal balanced collections, in a way which is faster than linear programming-based methods. In particular, we construct an algorithm to check if the core of a cooperative game is a stable set in the sense of von Neumann and Morgenstern. The algorithm implements a theorem according to which the core is a stable set if and only if a certain nested balancedness condition is valid. The second level of this condition requires generalizing the notion of balanced collection to balanced sets.

DOCTORAL THESIS

Title	Geometry of Set Functions in Game Theory: Combinatorial and Computational Aspects		
Defense	September 8th, 2023		
Jury	PHILIPPE BICH, Université Paris I Panthéon-Sorbonne	Chair	
	MICHEL GRABISCH, Université Paris I Panthéon-Sorbonne	Supervisor	
	JEAN-JACQUES HERINGS, Tilburg University	Examinator	
	MARINA NUÑEZ, Universitat de Barcelona	Reviewer	
	PHILIPPE SOLAL, Université Jean Monnet	Examinator	
	TAMÁS SOLYMOSI, Corvinus University of Budapest	Reviewer	
	PETER SUDHÖLTER, University of Southern Denmark	Supervisor	

COMMUNICATIONS

Upon invitation

1. 17th [Ordered Structures in Games and Decisions](#) conference, Paris, France (2023).
2. 22nd [Society for the Advancement of Economic Theory \(SAET\)](#) conference, Paris, France (2023).
3. [GO22: Games and Optimization 2022](#), Saint-Étienne, France (2022).

Per application

4. 18th [European Meeting in Game Theory \(SING18\)](#), Messina, Italy (2023).
5. 26th [Coalition Theory Network \(CTN\)](#) conference, Bielefeld, Germany (2023).
6. [Programme Gaspard Monge \(PGMO\) days 2021](#), Paris, France (2021).

7. 16th [European Meeting in Game Theory \(SING16\)](#), Granada (remote), Spain (2021).

Séminaires

8. Institut Henri Poincaré, [Junior parisian seminar in game theory](#), Paris, France (2023).
9. Paris School of Economics, [Doctorissimes](#), Paris, France (2022).
10. Centre d'Économie de la Sorbonne, [“Network and Games” seminar](#), Paris, France (2022).
11. Centre d'Économie de la Sorbonne, [PhD seminar](#), Paris, France (2021).
12. Institut Élie Cartan, [PhD seminar](#), Nancy, France (2021).

TEACHING (TUTORIALS)

▷ Academic year 2022-2023 :

Subject	Level	Cursus	Hours
Linear programming	Master 1	Mathematics	24h
Topology and differential calculus	Bachelor 3	Maths/Computer Science	42h
Microeconomics	Bachelor 3	Maths/Computer Science	48h
Linear algebra	Bachelor 3	Economics	36h
Linear algebra	Bachelor 2	Maths/Computer Science	30h

▷ Academic years 2021-2022 and 2020-2021 :

Subject	Level	Cursus	Hours
Linear programming	Master 1	Mathematics	24h
Linear algebra	Bachelor 3	Economics	36h

▷ Academic year 2019-2020 :

Subject	Level	Cursus	Hours
Linear algebra	Bachelor 3	Economics	36h
Python programming	Bachelor 1	Maths/Computer Science	48h

AWARDS

- Winner of the *Passeport pour le Master* scholarship from the Sorbonne Université foundation (69,000€).

RESPONSIBILITIES

- Member of the board of directors of Sorbonne Université (2018-2020).
- Member of the board of the mathematics department of Sorbonne Université (2018-2020).